

U.S. Patent Appln. No. 10/519,743  
Amendment  
Reply to Office Action dated July 16, 2008

Docket No. 9526-47

**AMENDMENTS TO THE DRAWINGS**

A replacement Figure is attached hereto. The figure has been amended such that reference character 1a designates the input and new reference character 1b designates the output. No new matter is added.

Attachment: One replacement sheet

### **REMARKS**

The foregoing amendments and these remarks are in response to the Office Action dated July 16, 2008. Applicant hereby requests a three month extension of time for filing this response. Authorization is given to charge the appropriate fees to Deposit Account No. 50-0951.

At the time of the Office Action, claims 1-10 were pending. In the Office Action, objections were raised to the drawings. Claims 1-10 were rejected under 35 U.S.C. §103(a). The objections and rejections are discussed in more detail below.

#### **I. Objections to the Drawings**

The drawings were objected to under 37 CFR §1.84(p)(4) because reference character "1a" has been used to designate both the input and output of the first compressor. Figure 1 has been amended to change the reference numeral which designates the output to "1b". This amendment is supported at least by page 6, line 5 of the application. Withdrawal of the objection is thus respectfully requested.

#### **II. Rejections based upon art**

Claims 1-10 were rejected under 35 U.S.C. §103(a) as being unpatentable over PCT Publication No. WO 01/66465 A1 to Moore (hereafter "*Moore*") in view of the article "Results and Experiences on Revamping of Large-Scale Ammonia Single-Line Plants", page 227, 1989, to Bendix et al. ("*Bendix*"), and PCT Publication No. WO 99/13963 to Torkilden et al. ("*Torkilden*"). The claims are believed to be patentable over these references.

*Moore* discloses washing the synthesis gas in a contacting device, namely a column 54 which is totally different from the claimed axial mixer. *Moore* teaches that a dehydrator 54 can be one of any number of known gas-liquid contacting devices that bring gas and liquid phase into intimate contact with each other for the purpose of a diffusional exchange. One of ordinary skill in the art at the time of the invention of the features of claim 1 would not consider the Venturi tube as an equivalent of the column contacting device, because these two apparatuses are different from a structural and functional point of view.

Some of the disadvantages of *Moore's* washing column are discussed at paragraphs 0009 and 0010 of the present application. Not only is a Venturi tube not a simple substitution for the column device of *Moore*, there is no incentive in the prior art to replace the column device of *Moore* with a Venturi tube, in order to solve the drawbacks discussed in in the present application. Applicant further notes that *Bendix* relates to revamping modifications connected with the specific provision of an additional make-up gas converter, in parallel with an existing main converter, as seen in Fig. 8. Hence, a skilled person seeking to eliminate the above drawbacks of *Moore*, would have no incentive to apply any teaching from *Bendix* due to different technical problems faced in these two patent documents.

Further, Applicant notes that one of the features of the presently claimed method and apparatus is that the claimed axial mixer is able to exploit the high pressure of the liquid ammonia stream, i.e., the difference (delta-pressure) between said high pressure of the liquid ammonia and the relatively low pressure of the synthesis gas taken from first or intermediate stage of compression. This delta-pressure gives the liquid ammonia a driving force which is effectively used to enhance the washing action and to obtain a further effect of compression of the gas, thus saving energy for the subsequent compression stage (2). See especially paragraph 0035-0036 of the present application.

In contrast, *Moore* cannot obtain any of the above advantages due to the inherent structure of the disclosed column dehydrator 54. Any pressure energy of the liquid ammonia is practically lost when it enters the column 54, rather than being used as in the present invention. Moreover, *Moore* teaches explicitly to reduce the pressure of the liquid ammonia before it enters the dehydrator, via the valve 55 (cf. page 10, line 28). This is a further confirmation that *Moore* ignores any use of the pressure energy of the liquid ammonia

*Bendix* discloses adding liquid ammonia to the gas from the discharge type of the third stage of the compressor in a Venturi tube, but is silent about the pressure thereof. It should also be noted that in *Bendix*, the syngas fed to the Venturi tube is taken from the third and final stage of the main syngas compressor i.e. being already at the operating pressure of the reaction, and hence the above cited positive effects are not achieved.

The amendments to claim 1 filed herein emphasize the feature of the delta-pressure between the pressurized liquid ammonia and the syngas. The amendment is supported, for example, at paragraph 0029 disclosing that ammonia is pressurized. The pressure is greater than that of the gas is a consequence of the gas being taken after the first or an intermediate stage of compression (i.e., the gas is still at a pressure level lower than that required for the synthesis reaction), and is further supported at paragraphs 0035 and 0036 disclosing that the gas is compressed through the mixing step with the liquid ammonia feed.

*Bendix* does not teach or suggest the pressure of the ammonia feed and does not teach or suggest feeding the liquid ammonia at a pressure greater than that of syngas to eliminate the pressure-reducing valve 55.


Claim 1 is believed to be patentable over the cited prior art for at least the foregoing reasons. The dependent claims are also believed allowable because of their dependence upon an allowable base claim, and because of the further features recited.

### **III. Conclusion**

Applicants have made every effort to present claims which distinguish over the prior art, and it is thus believed that all claims are in condition for allowance. Nevertheless, Applicants invite the Examiner to call the undersigned if it is believed that a telephonic interview would expedite the prosecution of the application to an allowance. In view of the foregoing remarks, Applicants respectfully request reconsideration and prompt allowance of the pending claims.

Respectfully submitted,

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